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Air Pollution Emissions Inventory Systems
Appendix B. Emissions Inventory in Canada
A Report of the NATO/CCMS Pilot Study on Air Pollution Assessment Methodology and Modeling

NATO Committee on the Challenges of Modern Society, Brussels (Belgium)

Jul 79

PB80-159551

COMMITTEE ON
THE CHALLENGES OF
MODERN SOCIETY

AIR POLLUTION EMISSIONS INVENTORY SYSTEMS APPENDIX B EMISSIONS INVENTORY IN CANADA

Number 104

NORTH ATLANTIC TREATY ORGANIZATION

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16. ABSTRACT

This document is an appendix to report number 104; it gives a general overview of emissions inventory systems as well as methods used in Canada.

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AIR POLLUTION EMISSIONS INVENTORY SYSTEMS

A Report of the NATO/CCMS Pilot Study
on Air Pollution Assessment Methodology and Modeling

No. 104, APPENDIX B

Air Pollution Emissions Inventory Systems used in Canada

COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY
NORTH ATLANTIC TREATY ORGANIZATION
(July 1979)

Preface

The North Atlantic Treaty Organization (NATO) established the "Committee on the Challenges of Modern Society" (CCMS) at the November 1969 meeting of the North Atlantic Council.

The CCMS was charged with developing meaningful environmental and social programs that complement other international programs, and with showing leadership, first, in solution of existing problems and, second, in development of long-range goals for environmental protection in the NATO sphere of influence and in other countries as well. A first Pilot Study on Air Pollution was initiated by the CCMS at its inaugural meeting in December 1969. The United States (Environmental Protection Agency) has been the pilot nation with the Federal Republic of Germany (Federal Ministry of the Interior) and Turkey (Scientific and Technical Research Council) as copilot-nations.

The Pilot Study on Air Pollution was an action program designed to demonstrate and encourage the utilization of existing knowledge for the development of air quality management programs. It entailed the demonstration of a system approach to air quality management. Case studies have been carried out in Ankara, Turkey; Frankfurt, Federal Republic of Germany; St. Louis, U. S.; Oslo, Norway; South Holland Region, The Netherlands (NATO/CCMS Report No. 6, Appendices A - E).

The results of the pilot study are documented in NATO/CCMS Report No. 6 (Revised) "Guidelines to Assessment of Air Quality" of October 1972 and in NATO/CCMS Report No. 33 (Final Report) containing 15 recommendations as well as in several other documents, listed as Annex II to this document.

Starting from three of the above recommendations (VI, VII and XIV) the Federal Republic of Germany proposed to initiate a new Pilot Study on Air Pollution Assessment Methodology and Modeling at the CCMS Plenary Session on October 22 and 23, 1974.

These NATO/CCMS Recommendations are:

RECOMMENDATION VI

Member nations will co-operate to develop standardized methods for emissions data storage and retrieval to support requirements in the conduct of national air quality management programs. The US National Emission Data System (NEDS) might serve as a model for a common international system.

RECOMMENDATION VII

Member nations will co-operate to develop standardized techniques for projecting emissions and predicting future ambient air quality.

RECOMMENDATION XIV

Member nations agree the CCMS modeling activity has shown that there is a widespread need for further international co-operation to accomplish the following tasks:

Bring together model developers and air quality managers for exchange of ideas, discussion of users' needs and demonstration of modeling techniques.

Standardize modeling techniques for specific air quality management applications and consider how computerized models might be made available for all users.

Continue to review on-going air quality assessment studies.

In spring 1975 the North Atlantic Council approved the German proposal. The pilot study work started with the Federal Republic of Germany (Federal Ministry of the Interior) as pilot nation and the United States of America (Environmental Protection Agency) and Belgium (Service du Premier Ministre) as co-pilot nations:
A Working Group and two Panels were established with the following functions:

Assessment Methodology Panel

- Pursue and carry out Recommendations VI and VII
- Continue to review present and future assessment studies with respect to the application of assessment methodology.

Modeling Panel

- Develop standardized models for various air quality management applications.
- Develop programs to improve modeler/user communications in conjunction with the Assessment Methodology Panel and the Working Group.
- Continue as an information forum on new modeling concepts and techniques, organizing once a year international technical meetings on air pollution modeling and its application.

In addition the Working Group established an Ad-Hoc Group on Air Quality Management Systems to revise and update the NATO/CCMS Report No. 6 (Revised) 1972 by preparing a new document on "Guidelines to Air Quality Management Systems".

Another Ad-Hoc Group was set up for compiling a Glossary of Terms frequently used in assessment methodology, modeling and air quality management systems.

As an outcome of this Pilot Study on Air Pollution Assessment Methodology and Modeling the following NATO/CCMS documents are published (see also Annex III):

Air Quality Management System

- Guidelines to Air Quality Management System.

Assessment Methodology

- Air Pollution Emissions Inventory Systems
- Air Pollution Emissions Projecting

Air Pollution Modeling

- Introduction to Air Quality Modeling
- Uses and Needs for Air Quality Modeling
- Bibliography on Grey Literature on Air Quality Modeling, Part I (Applied Models)
- Bibliography on Grey Literature on Air Quality Modeling, Part II (New Modeling Techniques)
- Practical Demonstration of Multiple Source Urban Air Quality Modeling (Gaussian Plume)
- Fundamentals for the Applications of a Gaussian Plume Model

Other Publications

- Glossary of Terms
- Proceedings of the 6th to 9th International Technical Meetings on Air Pollution Modeling and its Application
  (6th Meeting, 24. - 26. Sept. 1975, Frankfurt/Main, Germany)
  (7th Meeting, 7. - 10. Sept. 1976, Airlie House, USA)
  (8th Meeting, 20. - 23. Sept. 1977, Louvain-la-Neuve, Belgium)
  (9th Meeting, 29. - 31. Aug. 1978, Toronto, Canada).

The chairman of the Working Group wishes to acknowledge the scientists participating from pilot, copilot, and observer countries, and the many other persons, who assisted in the preparation of this document.

The panel, which performed diligently throughout the course of this effort, receives the highest praise. The panel members were:

Federal Republic of Germany - Pilot Country

F. Gerold
K. E. Joerss
H. Meinl

Belgium - Copilot Country

R. Dams
C. de Wispelaere

United States of America - Copilot Country

R. Baumann
J. Bosch
J. R. Hammerle

Canada - Observer

P. J. Choquette

France - Observer

W. Challemel du Rozier

Norway - Observer

O. I. Skogvold

The Netherlands - Oberserver

L. H. J. Wachters.

The addresses of the panel members are listed in Annex I.

Full recognition is given to each panel member for carrying out and coordinating review and other activities related to the development of this document in his respective country and to Ms. C. Morawa of the Federal Environmental Office, Germany for her effort in coordinating and organising and for editorial work.

For the Working Group,
Erich Weber, Chairman.

The present document is an appendix to the NATO/CCMS document

AIR POLLUTION EMISSIONS INVENTORY SYSTEMS

No. 104, October 1978

which gives a general overview of the matter of emissions inventory systems as well as of the methods currently applied in BELGIUM, CANADA, the FEDERAL REPUBLIC OF GERMANY, The NETHERLANDS, NORWAY and the UNITED STATES OF AMERICA.

It contains documentations of air pollution emissions inventory systems currently used in

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Canada	Appendix B
Germany, F. R.	Appendix C
The Netherland	Appendix D
Norway	Appendix E
United States	Appendix F

Each appendix is bound as a separate volume

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Part I:

EMISSIONS INVENTORY TECHNIQUES

Glossary of Terms

Source: specific plant, facility or area having one or more point sources (stacks, vents, etc.)

Source Type: sources are classified into source types according to similarities in processes, products, etc., e. g. cement manufacturing is a "source type" which includes all cement plants which are specific sources.

Category: source types are classified into categories according to similarities in economic and organizational structure.
For example, industrial processes is a "category" which includes all "source types" characterized as industrial sectors such as cement manufacturing, iron and steelmaking, petroleum refining.

1. Preamble

A national inventory of sources and emissions is a prerequisite to any national program of air pollution control and abatement. It provides the information that enables problem areas to be identified and priorities to be set. The information identifies and locates all sources, types and quantities of emissions. Although an emission inventory may be regarded as being simply an information storage, processing and retrieval system, it is nonetheless the most important planning tool in a comprehensive program of air pollution control. The data that a complete and up to date inventory provides may be used, for example, in the design of an air sampling network, to predict ambient air quality in a region, or to evaluate or modify a control program.

Within Environment Canada, the responsibility for the compilation of large scale inventories lies with the Pollution Data Analysis Division of the Air Pollution Control Directorate. The Directorate requires access to a current and comprehensive inventory of nationwide sources and emissions of air pollutants to establish priorities and enable control strategies to be developed and applied in an equitable manner throughout Canada. In the longer term, the inventory program provides increasingly accurate estimates of the impact of control programs on air pollution in the country. An inventory, therefore, serves the two-fold purpose of planning and evaluating air pollution control activities.

The task of compiling inventories in the Air Pollution Control Directorate began in 1972 and is, therefore, relatively new. This is because the Directorate, in its reorganized state and expanded role within the Department of the Environment, is also relatively new. The need for inventories, however, was recongnized at the onset of that reorganization.

By compiling such inventories it is possible to provide, as a service, specific data on all sources and emissions across Canada, as well as other relevant data associated with the sources. This service is of use especially to the Department of the Environment, also for other Federal Government Departments and Provincial and Municipal regulatory agencies.

2. Methodology

In the assessment of national air pollution, there is a need for accurate data on the quantity and characteristics of emissions from all sources that contribute to the problem. The numerous sources, and the diversity of source types, make field measurement of emissions on a source-by-source basis, at the point of release, impractical. There are other means by which the emission data for each source can be collected. Following is an overview of the two more important methods being utilized: (a) detailed data collection through questionnaires and interviews and (b) the estimation of emissions based mainly on emission factors and available data. These methods are discussed in terms of the two main categories or types of inventories carried out by Environment Canada:

- Potentially hazardous (to health and/or the environment) air pollutant inventories
- Common air pollutant inventories

2.1. Potentially Hazardous Air Pollutant Inventories

Under the Clean Air Act of 1971, the Federal Government is empowered to regulate emissions of any air contaminants which would constitute a significant danger to health, or where they would result in violation of an international agreement. The responsibility for declaring a contaminant hazardous to

health lies with the Department of Health and Welfare. It is on the basis of the advice received from that Department that decisions are taken in terms of a specific regulatory activity. To date the following contaminants have been declared hazardous to health and regulatory activity has been undertaken to reduce their emissions to the atmosphere: mercury, lead, asbestos, vinyl chloride, and arsenic. The Department of Health and Welfare partly bases its judgment on the results of the air pollution emissions inventory undertaken for each of the contaminants which may be a potentially significant problem.

The starting point of the inventory is an extensive literature search to review the published material concerning the substance(s) to be investigated. Information regarding the characteristics of the industries which are actual and potential emitters of the pollutant(s) being considered is assembled. Plant visits and interviews may, in some cases, be of benefit to supplement information available from the literature.

Following identification of the industrial sectors which are or could be emitters of a particular pollutant, and if considered appropriate, questionnaires are developed. It may be possible, and preferable, to design a general type of questionnaire applicable to any industrial sector. Although this prevents obtaining very detailed information it may be found to be quite acceptable for inventory purposes. A general type questionnaire used by Environment Canada in 1977 to gather background information on a number of substances is provided as an example in the Addendum. If this general approach is not possible then specific questionnaires applicable to each type of industrial sector are designed. Essential to any questionnaire are questions related to the concentration of the particular elements in the raw

materials and the end products, the flow of the element through each process stage, the potential emission sources in the plant, the existing and planned control measures and their mechanical characteristics, the quantity, physical and chemical characteristics of the emissions if known and the plant production schedule.

The data collected are first analyzed for accuracy and then processed and classified systematically according to type of emission source and geographic location. The types of emission sources which are investigated in any inventory are:

(1) Industrial processes
(2) Fuel Combustion - Stationary Sources
(3) Transportation
(4) Solid Waste Incineration
(5) Miscellaneous Sources

Sources of type (1), and occasionally (2) and (4) above are well suited to the questionnaire method if their number is relatively small. Where pertinent information is lacking for these sources, and for all other sources, it is necessary to base emissions on information found in the literature and on emission factors. An emission factor is defined as: the statistical average or a quantitative estimate of the rate at which a pollutant is released to the atmosphere as a result of an activity, such as combustion or industrial production, divided by the level of that activity. The emission factor relates the quantity of pollutants emitted to some indicator such as production capacity, rate of raw material usage, or quantity of fuel burned. Where applicable, the source of many of the emission factors employed to generate the data for inventories is from published documents of the United States Environmental Protection Agency (EPA). These documents usually provide factors compiled from source tests, material balance, studies and engineering estimates for the major sources of air pollution within the United States.

The accuracy of an emission factor is directly related to the number of field studies performed on the particular sources and, in general, the more intensive field efforts have been concentrated on the major sources of air pollution. The limitations and applicability of emission factors should be understood: in general, emission factors are not precise indicators of emissions from a single source, but their validity increases with the number of sources and processes to which they are applied. When such limitations are taken into account, emission factors can be extremely useful in conducting source inventories.

The majority of industrial operations within Canada employ the same processes as utilized in the United States. The emission factors compiled in the United States are, therefore, usually the best available for application to much of Canadian industrial activity. In certain instances, however, considerable field work has been conducted on Canadian industry and, in such cases, preference is given to the resulting Canadian data because it is more representative of our own situation.

The data relating to production and fuel consumption quantities of the various sources are usually obtained from Statistics Canada. This is supplemented by data published by a number of industrial associations, and by information available from other federal government departments. In a number of cases, the productive capacity of a specific source is available but the actual production is not. Production figures are usually avail[illegible] only on a provincial or national basis. By knowing the [illegible]city of a specific source, the production is estimated on [illegible]ne basis of share of productive capacity.

In the case of population based emissions, such as automobiles, fuel combustion, incinerators, and surface coatings, the sum of emission estimates is divided by the population and a per capita estimate is obtained. The area emissions are then estimated using the per capita emission rate together with the population for a given location.

The emissions inventory data prepared by Environment Canada have usually been reported on a national and provincial basis. Recently these data have been analyzed further to enable a breakdown for smaller geographical areas such as counties and cities to be performed.

Since 1972 Environment Canada has completed inventories for twelve pollutants considered potentially hazardous or hazardous to health and/or the environment. They are:

(1) lead, asbestos, mercury, beryllium (base year 1970)
(2) vanadium (base year 1972)
(3) zinc, cadmium arsenic, manganese, fluoride (base year 1972)
(4) vinyl chloride, selenium (base year 1973)

The inventory reports involving the groups of pollutants under (1) and (3) above were based on studies undertaken for Environment Canada by consultants. Other inventory studies were carried out internally. All studies are available upon written request.

Recently a contract was completed with a consulting firm for the gathering of background information, through the questionnaire approach, for the future compilation of national inventories of nickel, cobalt, antimony, tin, bismuth, chromium, copper, barium, phosphorus and their compounds, and

chlorine and hydrogen sulfide gas. The study was based on 1976 data and the resulting inventories are expected to be published in 1979/80.

Finally, a third method of compiling inventories should be briefly mentioned. That method employed by some states (U.S.) provinces and cities for information collection requires that individual pieces of equipment (boilers, incinerators, etc.) be registered with the control authority. Detailed information on the air pollution aspect of control equipment is collected. This method is particularly suitable for updating purposes.

2.2. Common Air Pollutant Inventories

Pollutants under the "common air pollutant" category are those which are the most significant from a quantitative point of view. They are particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide.

The methodology followed for this second type of inventory follows closely that for the potentially hazardous pollutants inventories (2.1. above) with the exception that questionnaires are usually not designed because of the numerous sources involved. The only feasible method of determining nationwide emissions of "common air pollutants" is to make generalized estimates of typical emissions from each of the source types and to modify and augment these estimates with source data as it is generated through other means.

In many cases the source of emission factors employed to generate the data for this type of inventory is the "Compilation of Air Pollutant Emission Factors" published by EPA.

Where available, emission factors developed for Canadian conditions by the Air Pollution Control Directorate are used because they better represent the Canadian situation. Environment Canada's regulation and guideline development program for selected industrial sectors is increasing the acquisition of this form of information. Another source of information which is used are the data collected from the potentially hazardous pollutants inventory questionnaires.

The source types investigated are the same as those for the potentially hazardous pollutants inventories: transportation, fuel combustion-stationary sources, industrial processes, solid waste incineration and miscellaneous sources. Following is an overview of the information involved for each of these source types.

2.2.1 Transportation

Data from this source type are grouped into categories of gasoline-powerd motor vehicles, aircraft, railroads, marine, non-highway use of gasoline, and diesel (internal) combustion.

For motor vehicles, emissions of nitrogen oxides, hydrocarbons and carbon monoxide are calculated using vehicle registration figures, the age distribution of Canadian vehicles, average gasoline consumption per mile, estimated speed distribution, emission rate degradation factors and estimated vehicle miles travelled per year. Emissions of particulates and sulfur oxides are based upon registrations and emission factors.

Aircraft emissions are based on the number of each type registered in Canada, the size distribution of planes within each type and the average number of engines per plane for each type. Emissions are calculated using EPA factors adapted to Canadian conditions. Aircraft types investigated are jets, turboprops, piston-engined planes and helicopters.

Emissions from the railroads and marine categories are based on emission factors applicable to the type of fuel consumed. Emissions from the non-highway use of motor fuels are based on emission factors developed for gasoline-powered motor vehicles applied to the portion of gasoline sales not consumed on public roads and highways.

2.2.2 Fuel Combustion - Stationary Sources

Fuel consumption data are grouped into categories of power generation by utilities, industrial use, commercial use, and residential use. Emissions are based mainly on EPA factors applied to the amount and type of fuel consumed together with the type of control utilized.

2.2.3 Industrial Processes

The emissions estimated for this sources group relate to the various processes involved. The lack of published data on production, type of equipment and controls, as well as on emission factors, makes it very difficult to include estimates of emissions from all industrial process sources. Although the emissions from the majority of these sources have been estimated, some sources such as mining are not presently inventoried because of a complete lack of pertinent information. The amount of Canadian information necessary to develop emission estimates is continually increasing. This is supplemented with EPA emission factors.

2.2.4 Solid Waste Incineration

Among the sources considered in this sector are municipal sewage sludge, industrial and commercial incineration and wigwam burners. Emissions are mostly based on EPA factors.

2.2.5 Miscellaneous Sources

Data from this source type include categories such as forest fires, slash burning, structural fires, surface coatings application, fertilizer application, gasoline marketing and dry cleaning. Emissions are usually based upon studies done by EPA.

As in the case of potentially hazardous pollutants, data on the "common" type air pollutants are usually reported on a national and provincial basis although recently these data have been analyzed further to enable identification of information at the city and county levels.

The nationwide inventory of common air pollutants is in itself an extensive study because of the number of emission sources involved. Environment Canada had this inventory compiled by consultants for the base year 1970, following the above methodology. The study was published in late 1973. The Directorate updated this inventory twice, again following the same methodology, for the base year 1972 and 1974. Currently the inventory for the year 1976 is being developed. It is intended to update the nationwide inventory of general air pollutants on a two-year basis and this should reflect over a period of time the impact of pollution control legislation, changes in consumer fuel usage and trends in manufacturing activity, among other factors.

Addendum I:

EXAMPLE INDUSTRIAL QUESTIONNAIRE USED IN ENVIRONMENT CANADA'S STUDIES OF POTENTIALLY HAZARDOUS POLLUTANTS

Reproduced from best available copy.

B - I, 14

NATIONAL INVENTORY OF SOURCES AND EMISSIONS TO THE ATMOSPHERE OF ANTIMONY, BARIUM, BISMUTH, CHROMIUM, COBALT, COPPER, NICKEL, PHOSPHORUS, TIN AND THEIR COMPOUNDS AND OF CHLORINE AND HYDROGEN SULFIDE GAS

FOR

ENVIRONMENT CANADA

GENERAL INSTRUCTIONS

1. All information should be for the year 1976. Please indicate if otherwise.

2. Questionnaires should be completed and returned within forty-five (45) days from date received.

3. Please return questionnaire to:

   Pollution Data Analysis Division
   Air Pollution Control Directorate
   Environmental Protection Service
   Environment Canada
   Ottawa, Ontario K1A 1C8

   A self-addressed return envelope is provided for your convenience.

4. Any questions and enquiries concerning the questionnaire form should be directed to:

   Pollution Data Analysis Division
   Air Pollution Control Directorate
   Environmental Protection Service
   Environment Canada
   Ottawa, Ontario K1A 1C8

5. All answers are confidential and the information will be used only by the Federal Government and Provincial Departments of the Environment. If information is made available to any other agency it will be in the form of industry aggregates. If identification of individual companies is possible from the aggregate format, it will not be released.

6. When actual data are not available, please give estimated values in brackets.

7. Mark N/A if a question does not apply.

8. Where inadequate space has been provided on the questionnaire, please complete your answer using the French answer sheet.

9. One questionnaire should be completed for each plant.

10. An example of a completed questionnaire is attached and is for your use as a guide.

SPECIFIC INSTRUCTIONS

The following gives additional information on the questionnaire:

SECTION 1. GENERAL INFORMATION

In order that your plant may be geographically located it is necessary to report its latitude and longitude (in degrees and minutes) or by giving the Universal Transverse Mercator (UTM) Grid Reference Number. Be sure to include the map reference number, and if the UTM is given, to include the zone number.

Maps giving latitude, longitude and UTM are generally available from your Provincial Surveys and Mapping Branch or from Canada Map Office, 615 Booth Street, Ottawa, Ontario K1A 0E9. Charges for maps are as follows:

Scale 1 : 25,000 - $1.50 each Scale 1: 50,000 1/2 Map - $0.75 each

SECTION 2. BLOCK FLOW DIAGRAM

Sketch a block flow diagram on the sheet provided showing the main process stages and the points of emission to the atmosphere. This diagram will also assist in completing the subsequent sections.

SECTION 3. PROCESS INFORMATION

1. TYPE OF PROCESS — Indicate the usual name applied to the overall process such as ore mining and milling, brass and bronze foundry, manufacture of pigments and paints, copper smelting, etc.

2. MAIN PROCESS STAGES — Indicate the main operations involved in the process such as crushing, screening, drying, charging, blowing, roasting, chlorine plant, etc.

3. MATERIAL PROCESSED
   (a) This is the main or usual material(s) processed in each stage.
   (b) If the material passes from one stage to the next with only physical changes such as drying and crushing, the column material would not change but the quantity might.
   (c) If the material undergoes a chemical change in a process such as roasting, the "material processed" would be, for example, copper sulfide, and the "material processed" in the next stage would be copper oxide.

4. APPROXIMATE QUANTITY PROCESSED — Where known, please indicate the approximate quantity processed in each stage.

SECTION 4. RAW MATERIALS

SECTION 5. PRODUCTS

1. NAME — Usual name of material such as nickel ore concentrate, blister copper, barium chloride, phosphoric acid, etc.

2. PHYSICAL FORM — State whether material is coarse rock, granular, powder, liquid, gas, etc.

SECTION 6. FUEL

1.	TYPE	Indicate the type of fuel used such as wood, coal, Bunker C, diesel, natural gas, etc.
2.	ORIGIN	If known, give the country, province or state (if in USA) where fuel originated. Otherwise give the supplier's name.
3.	CONSUMPTION PER MONTH	Give the number of barrels, tons, cubic feet of fuel, etc. burned in the process per month. Please specify units of measurement.
4.	MONTHS	If there are seasonal variations in fuel use, indicate quantity under CONSUMPTION PER MONTH and range under MONTHS.
5.	USE	Indicate whether fuel is used for drying, roasting, power generation, melting, etc. process.
6.	CONTROL EQUIPMENT	(a) If control equipment such as a cyclone, baghouse, multiple cyclone, venturi scrubber, electrostatic precipitator, etc. is used prior to exhausting flue gases, please give the name of the control equipment and its operating efficiency. (b) If more than one piece of equipment operates in tandem, such as a venturi scrubber followed by a baghouse, then give names of both pieces and operating efficiency of the control equipment for removing gases or particulate or both. (Particulate is defined as both solid and liquid particles.)
7.	FUEL ANALYSIS	If the concentration in the fuel of any of the substances under study is known, please include concentration.

SECTION 7A. EMISSION INFORMATION

1.	PROCESS STAGE OR STAGES	This refers to the main process stage or stages in SECTION 3 which contribute to the emissions from an emission point. For several process stages exhausting through the same stack, it is not necessary to know the contribution of each one.
2.	POINT OF EMISSION	This refers to the point in the process stage or stages where gas or gases are emitted to the atmosphere, e.g from such equipment as ventilation hoods, cyclones, venturi scrubber, baghouse, multiple cyclones, dryer stacks, process stacks, etc.
3.	CONTROL EQUIPMENT	This refers to equipment such as cyclones, scrubbers, baghouses, etc. If one or more control devices are used in tandem, give the name of both pieces and their operating efficiency for removal of gases or particulate or both. (Particulate is defined as both liquid and solid particles.)
4.	FLOW RATE OF GAS	acfm refers to actual cubic feet per minute.
5.	TOTAL PARTICULATE	This should be the total amount of particulate being emitted <u>after</u> the control equipment and expressed as "grains per actual cubic foot".
6.	QUANTITY OF EMISSIONS	Emissions of the substances of interest should be reported in terms of the element not the compound (except hydrogen sulfide). For example, if copper is emitted as copper oxide the mass of copper present in the compound should be specified rather than the total mass of oxide emitted.

SECTION 7B. OTHER CHEMICAL FORMS

Answer this section only if there is more than one chemical form of an emission under any one of the three columns.

SECTION 7C. BASIS OF ESTIMATE

Indicate whether the information was based on actual source testing, mass balance calculations, equipment suppliers' information, emission factors, etc.

SECTION 8. PARTICLE SIZE DISTRIBUTIONS

1.	POINT OF EMISSION	Please use the same terms as those used in SECTION 7A. EMISSION INFORMATION.
2.	PARTICLE SIZE RANGE	In this column indicate the range of particle size such as 5 to 10 microns.
3.	TOTAL PERCENTAGE WEIGHT IN RANGE	The weight of particulate in each particle size range divided by total weight of particulate in sample gas X 100.

The following pages show as an example of application the completed questionnaire forms for a theoretical copper smelting plant.

NATIONAL INVENTORY OF SOURCES AND EMISSIONS TO THE ATMOSPHERE OF ANTIMONY, BARIUM, BISMUTH, CHROMIUM, COBALT, COPPER, NICKEL, PHOSPHORUS, TIN AND THEIR COMPOUNDS AND OF CHLORINE AND HYDROGEN SULFIDE GAS

FOR

ENVIRONMENT CANADA

QUESTIONNAIRE

1. GENERAL INFORMATION

(Please Print or Type)

A. Company Name COPPER METAL & ALLOYS CO. LTD.

Plant Address 124 ANODE ROAD

City COPPERVALE

County SUNSHINE COAST REGIONAL DISTRICT

Province or Territory B. C.

Latitude 49° 31.5'

Longitude 123° 42'

UTM (if available) 494 854 ZONE 10 MAP NO. 92 G/12 E

Mailing Address 3822 GEORGIA STREET

City VANCOUVER

Province or Territory B. C.

Postal Code V1B 2C4

B. Person to contact about this form MR. L. O. RAINE

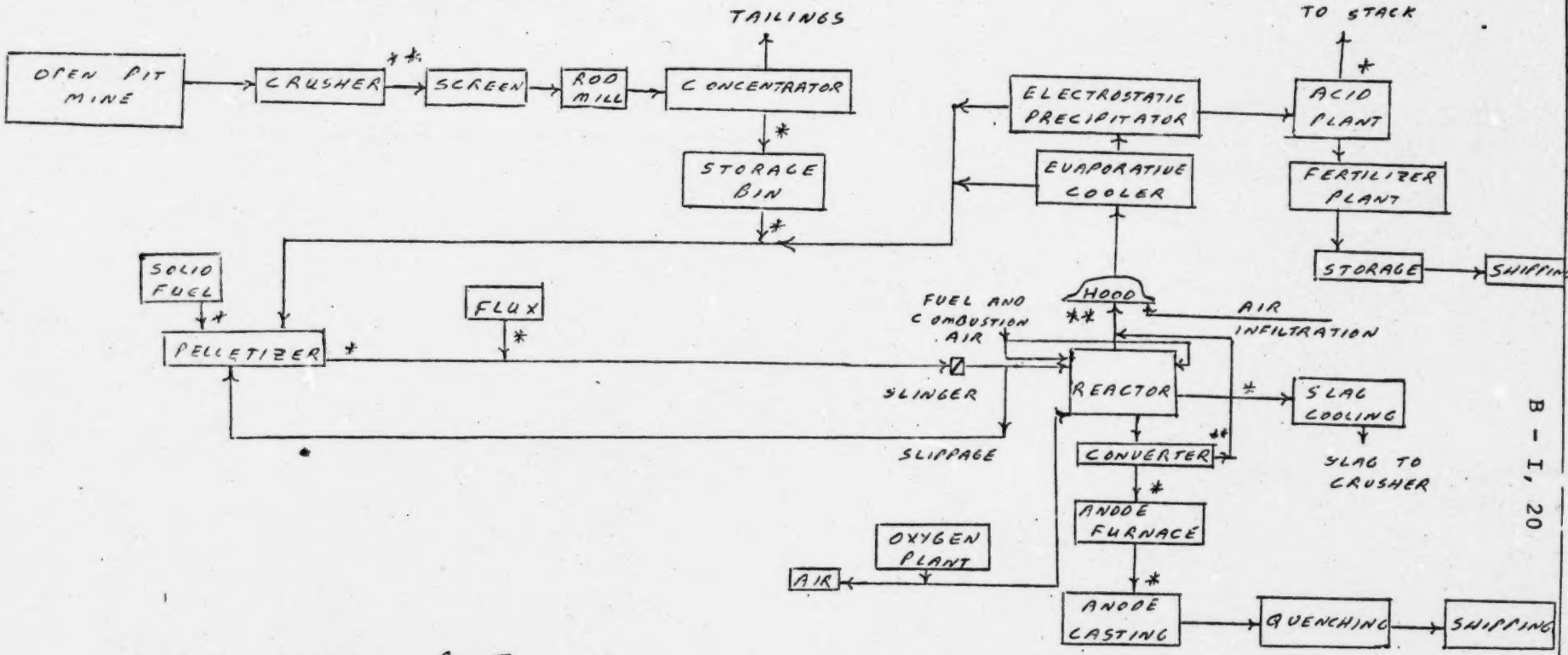
Position OPERATIONS SUPT. Telephone (604) 555-2323

C. Parent Company N/A

D. Labour Force 103 persons (production)

Date JUNE 10, 1977 Signature of a Senior Company Representative L O Raine

2. BLOCK FLOW DIAGRAM — PRIMARY COPPER SMELTER



* MINOR EMISSION POINT

** MAJOR EMISSION POINT

3. PROCESS INFORMATION

TYPE OF PROCESS COPPER MINING AND SMELTING

	MAIN PROCESS STAGES	MATERIAL PROCESSED	APPROXIMATE QUANTITY PROCESSED (tons/day)	OPERATING SCHEDULE			IF SEASONAL GIVE MONTHS OF OPERATION
				Hours/Day	Days/Week	Weeks/Year	
1	MINING	COPPER ORE	1,000	8	5	50	
2	CONCENTRATING	COPPER ORE	1,000	24	7	50	
3	CONTINUOUS REACTOR	COPPER CONCENTRATE	218	24	7	50	
4	CONVERTING	COPPER MATTE	189	24	7	50	
5	ANODE FURNACE	COPPER METAL	145	24	7	50	
6	ACID PLANT	REACTOR AND CONVERTER GASES	75	24	7	50	
7	FERTILIZER PLANT	SULPHURIC ACID	215	24	7	50	
8							
9							
10							
11							
12							

4. RAW MATERIALS

	NAME	TOTAL QUANTITY PROCESSED (tons/year)	QUANTITY IMPORTED FROM OUTSIDE CANADA (tons/year)	PHYSICAL FORM	PERCENTAGE BY WEIGHT					
					ANTIMONY (as Sb)	BARIUM (as Ba)	BISMUTH (as Bi)	CHROMIUM (as Cr)	COBALT (as Co)	COPPER (as Cu)
1	COPPER ORE	350,000	0	ROCK	0.0005		0.0009		0.002	7.50
2	COPPER CONCENTRATE	50,000	0	POWDER	0.002		0.001		0.005	30.00
3	AQUEOUS AMMONIA	263,375	0	LIQUID						
4										
5										
6										
7										

CONTINUED

	PERCENTAGE BY WEIGHT				
	NICKEL (as Ni)	PHOSPHORUS (as P)	TIN (as Sn)	CHLORINE GAS (as Cl_2)	HYDROGEN SULFIDE (as H_2S)
1	0.003		0.0001		
2	0.007		0.002		
3					
4					
5					
6					
7					

5. PRODUCTS

	NAME	TOTAL QUANTITY PRODUCED (tons/year)	QUANTITY EXPORTED OUTSIDE OF CANADA (tons/year)	PHYSICAL FORM	PERCENTAGE BY WEIGHT					
					ANTIMONY (as Sb)	BARIUM (as Ba)	BISMUTH (as Bi)	CHROMIUM (as Cr)	COBALT (as Co)	COPPER (as Cu)
1	COPPER METAL	41,250	35,000	ANODES	0-003		0.003		0.009	99.5
2	SULPHURIC ACID	25,550	0	LIQUID						
3	AMMONIUM SULFATE	101,357	46,565	GRANULAR						0.0005
4										
5										
6										
7										

CONTINUED

	PERCENTAGE BY WEIGHT				
	NICKEL (as Ni)	PHOSPHORUS (as P)	TIN (as Sn)	CHLORINE GAS (as Cl_2)	HYDROGEN SULFIDE (as H_2S)
1	0.014		0.008		
2					
3					
4					
5					
6					
7					

6. FUEL

	TYPE	ORIGIN OR SUPPLIER	CONSUMPTION PER MONTH (indicate units)	MONTHS (if seasonal) FROM	TO	PROCESS OR USE	CONTROL EQUIPMENT TYPE	OPERATING EFF (%) Part.	Gaseous	FUEL ANALYSIS IF KNOWN (ppm)	
1	COAL (20 MILLION BTU/TON)	BRITISH COLUMBIA	17 TONS			REACTOR	ELECTROSTATIC PRECIPITATOR	98-5		Antimony (as Sb)	3
										Barium (as Ba)	22
										Bismuth (as Bi)	2
										Chromium (as Cr)	14
										Cobalt (as Co)	5
										Copper (as Cu)	12
										Nickel (as Ni)	20
										Phosphorus (as P)	42
										Tin (as Sn)	1
										Chlorine Gas (as Cl2)	10
										Hyd. Sulfide (as H2S)	
2	BUNKER "C" (No. 6 OIL)	ALBERTA	65,000 GAL			REACTOR	ELECTROSTATIC PRECIPITATOR	98-5		Antimony (as Sb)	<0.02
										Barium (as Ba)	0.09
										Bismuth (as Bi)	
										Chromium (as Cr)	<0.005
										Cobalt (as Co)	<0.004
										Copper (as Cu)	1.0
										Nickel (as Ni)	15.0
										Phosphorus (as P)	
										Tin (as Sn)	<0.01
										Chlorine Gas (as Cl2)	
										Hyd. Sulfide (as H2S)	
3	BUNKER "C" (No. 6 OIL)	ALBERTA	14,000 GAL			REACTOR	ELECTRASTATIC PRECIPITATOR	98-5		Antimony (as Sb)	
										Barium (as Ba)	AS
										Bismuth (as Bi)	ABOVE
										Chromium (as Cr)	(2)
										Cobalt (as Co)	
										Copper (as Cu)	
										Nickel (as Ni)	
										Phosphorus (as P)	
										Tin (as Sn)	
										Chlorine Gas (as Cl2)	
										Hyd. Sulfide (as H2S)	

4. FUEL (Continued)

	TYPE	ORIGIN OR SUPPLIER	CONSUMPTION PER MONTH (indicate units)	MONTHS (if seasonal) FROM	TO	PROCESS OR USE	CONTROL EQUIPMENT TYPE	OPERATING EFF (%) Part.	Gaseous	FUEL ANALYSIS IF KNOWN (ppm)	
4	NATURAL GAS	ALBERTA & B.C.	1800 MM CU. FT.	MAR. 1	TO OCT. 15	ANODE FURNACE	VENTURI WET SCRUBBER	95		Antimony (as Sb)	N/A
										Barium (as Ba)	
										Bismuth (as Bi)	
										Chromium (as Cr)	
										Cobalt (as Co)	
										Copper (as Cu)	
										Nickel (as Ni)	
										Phosphorus (as P)	
										Tin (as Sn)	
										Chlorine Gas (as Cl2)	
										Hyd. Sulfide (as H2S)	
5	BUNKER "C" (No. 6 OIL)	ALBERTA	12,500 GAL	OCT. 15	TO FEB. 28	ANODE FURNACE	VENTURI WET SCRUBBER	95		Antimony (as Sb)	<0.02
										Barium (as Ba)	0.09
										Bismuth (as Bi)	
										Chromium (as Cr)	<0.003
										Cobalt (as Co)	<0.004
										Copper (as Cu)	1.0
										Nickel (as Ni)	15.0
										Phosphorus (as P)	
										Tin (as Sn)	<0.01
										Chlorine Gas (as Cl2)	
										Hyd. Sulfide (as H2S)	
6										Antimony (as Sb)	
										Barium (as Ba)	
										Bismuth (as Bi)	
										Chromium (as Cr)	
										Cobalt (as Co)	
										Copper (as Cu)	
										Nickel (as Ni)	
										Phosphorus (as P)	
										Tin (as Sn)	
										Chlorine Gas (as Cl2)	
										Hyd. Sulfide (as H2S)	

7A. EMISSION INFORMATION

	PROCESS STAGE OR STAGES	POINT OF EMISSION	CONTROL EQUIPMENT TYPE	OPERATING EFFIC (%) Gases	OPERATING EFFIC (%) Part.	FLOW RATE OF GAS (acfm)	TEMP. OF GAS (F)	TOTAL PART. (gr/acf)	EMISSIONS AND THEIR COMPOUNDS	QUANTITY OF EMISSIONS (tons/yr) (as element) Gaseous	Liquid	Part	CHEMICAL FORM Gaseous	Liquid	Particulate
1	OPEN PIT MINING	FUGITIVE	NIL					N/A	Antimony						ANTIMONY TRISULPHIDE
									Barium						
									Bismuth						BISMUTH TRISULPHIDE
									Chromium						
									Cobalt						COBALT SULPHIDE
									Copper						COPPER SULPHIDE
									Nickel						NICKEL SULPHIDE
									Phosphorus						
									Tin						TIN OXIDE
									Chlorine						
									Hydrogen Sulfide						
2	CRUSHER AND SCREENING	BAGHOUSE AT CRUSHER BUILDING	BAGHOUSE		99.9%	15,000	AMBIENT	0.025	Antimony			<0.001			
									Barium						
									Bismuth			<0.001			AS
									Chromium						
									Cobalt			<0.001			ABOVE
									Copper			1.013			
									Nickel			<0.001			
									Phosphorus						
									Tin			<0.001			
									Chlorine Gas						
									Hydrogen Sulfide						
3	CONCENTRATE STORAGE BIN, FLUX BIN, PELLETIZER, SOLID FUEL BIN	BAGHOUSE AT PELLETIZER PLANT	BAGHOUSE		99.9%	25,000	AMBIENT	0.022	Antimony			<0.001			
									Barium						
									Bismuth			<0.001			AS
									Chromium						
									Cobalt			0.001			ABOVE
									Copper			5.94			
									Nickel			0.001			
									Phosphorus						
									Tin			<0.001			
									Chlorine Gas						
									Hydrogen Sulfide						

7A. EMISSION INFORMATION

PROCESS STAGE OR STAGES	POINT OF EMISSION	CONTROL EQUIPMENT TYPE	OPERATING EFFIC (%) Gases	Part.	FLOW RATE OF GAS (acfm)	TEMP. OF GAS (F)	TOTAL PART. (gr/acf)	EMISSIONS AND THEIR COMPOUNDS	QUANTITY OF EMISSIONS (tons/yr) (as element) Gaseous	Liquid	Part	CHEMICAL FORM Gaseous	Liquid	Particulate
4 REACTOR AND CONVERTER	ACID PLANT STACK	ELECTROSTATIC PRECIPITATOR BEFORE ACID PLANT SCRUBBER WITH MIST ELIMINATOR	98	98-5 95	20,000	167	0.020	Antimony			<0.001			ANTIMONY
								Barium						
								Bismuth			<0.001			BISMUTH
								Chromium						
								Cobalt			<0.001			COBALT OXIDE
								Copper			0.237			SEE 26
								Nickel			<0.001			NICKEL OXIDE
								Phosphorus						
								Tin			<0.001			TIN
								Chlorine						
								Hydrogen Sulfide						
5 ANODE FURNACE, ANODE CASTING	ANODE PLANT STACK	VENTURI WET SCRUBBER	90	95	20,000	180	0.050	Antimony			<0.001			AS ABOVE
								Barium						
								Bismuth			<0.001			
								Chromium						
								Cobalt			<0.001			
								Copper			1.7			
								Nickel			0.002			
								Phosphorus						
								Tin			<0.001			
								Chlorine Gas						
								Hydrogen Sulfide						
6 ACID PLANT	ACID PLANT STACK	SCRUBBER WITH MIST ELIMINATOR	98	95	20,000	167	0.007	Antimony			<0.001			AS ABOVE
								Barium						
								Bismuth			<0.001			
								Chromium						
								Cobalt			<0.001			
								Copper			<0.001			
								Nickel			<0.001			
								Phosphorus						
								Tin			<0.001			
								Chlorine Gas						
								Hydrogen Sulfide						

7A. EMISSION INFORMATION

	PROCESS STAGE OR STAGES	POINT OF EMISSION	CONTROL EQUIPMENT TYPE	OPERATING EFFIC (%) Gases	OPERATING EFFIC (%) Part.	FLOW RATE OF GAS (acfm)	TEMP. OF GAS (F)	TOTAL PART. (gr/acf)	EMISSIONS AND THEIR COMPOUNDS	QUANTITY OF EMISSIONS (tons/yr) (as element) Gaseous	Liquid	Part	CHEMICAL FORM Gaseous	Liquid	Particulate
7	FERTILIZER DRYER COOLER & FERTILIZER GRANULATOR	FERTILIZER PLANT	CYCLONIC CLEANER		97	15,000	135	0.125	Antimony			<0.001			ANTIMONY
									Barium						
									Bismuth			<0.001			BISMUTH
									Chromium						
									Cobalt			<0.001			COBALT OXIDE
									Copper			0.167			SEE 7B
									Nickel			<0.001			NICKEL OXIDE
									Phosphorus						
									Tin			<0.001			TIN
									Chlorine						
									Hydrogen Sulfide						
8									Antimony						
									Barium						
									Bismuth						
									Chromium						
									Cobalt						
									Copper						
									Nickel						
									Phosphorus						
									Tin						
									Chlorine Gas						
									Hydrogen Sulfide						
9									Antimony						
									Barium						
									Bismuth						
									Chromium						
									Cobalt						
									Copper						
									Nickel						
									Phosphorus						
									Tin						
									Chlorine Gas						
									Hydrogen Sulfide						

7B. OTHER CHEMICAL FORMS
(answer only if applies from 7A)

PROCESS STAGE NO.	OTHER CHEMICAL FORMS		
	GASEOUS	PARTICULATE	LIQUID
4		COPPER SULFIDE	
		COPPER OXIDE	

7C BASIS OF ESTIMATE

PROCESS STAGE NO.	BASIS OF ESTIMATE
1	DATA NOT AVAILABLE
2	SOURCE TESTING OF BAGHOUSE
3	BAGHOUSE SUPPLIER'S INFORMATION
4	EQUIPMENT SUPPLIER'S INFORMATION & DESIGN CRITERIA
5	SOURCE TESTING OF SCRUBBER
6	MASS BALANCE CALCULATIONS
7	SOURCE TESTING OF CYCLONE

8. PARTICLE SIZE DISTRIBUTION DATA

Please complete if information available.

POINT OF EMISSION	PARTICLE SIZE RANGE (indicate units)	TOTAL % BY WEIGHT IN RANGE
CRUSHER BUILDING BAGHOUSE	> 5 MICRONS	5.0
	1 TO 5 MICRONS	28-5
	< 1 MICRON	66-5
PELLETIZING PLANT BAGHOUSE	> 5 MICRONS	7-5
	1-5 MICRONS	20-0
	< 1 MICRON	72-5
ACID PLANT STACK	> 10 MICRONS	11-0
	5-10 MICRONS	16-5
	1-5 MICRONS	21-0
	< 1 MICRON	51-5
ANODE FURNACE SCRUBBER STACK	> 20 MICRONS	6-5
	10-20 MICRONS	9-5
	5-10 MICRONS	17-0
	1-5 MICRONS	23-0
	< 1 MICRON	44-0
FERTILIZER PLANT CYCLONE	> 20 MICRONS	17-0
	10-20 MICRONS	22-0
	5-10 MICRONS	22-5
	1-5 MICRONS	19-0
	< 1 MICRON	19-5

9. EMISSIONS 1977

If there has been any process changes or modifications or pollution control equipment added in 1977 that would affect any of your emissions, please describe briefly below. In addition if any such changes are planned please identify, and provide anticipated completion date.

1) A MIST ELIMINATOR WAS INSTALLED ON THE ANODE FURNACE SCRUBBER IN JANUARY 1977.

2) A WET SCRUBBER WILL BE INSTALLED IN SERIES WITH THE FERTILIZER PLANT CYCLONE IN LATE 1977 (NOVEMBER)

Part II:

DATA HANDLING TECHNIQUES

1. Preamble

Environment Canada began its air pollutant inventory program in 1972 by contracting for the compilation of a nationwide inventory of air pollutant emissions. The pollutants considered were particulates, sulfur oxides, nitrogen oxides, hydrocarbons and carbon monoxide. An inventory of the sources and emissions of lead, asbestos, mercury and beryllium, which were categorized as potentially hazardous pollutants, was carried out under contract shortly thereafter. The collection of data from these inventories and from others which were later carried out in-house or again by contract, was done mainly to meet immediate short-term needs, and until very recently suffered from a lack of co-ordination.

The method of utilizing collected data to produce an inventory was best described, up to recently, as a manual method using a manually maintained data base. The result has been an inventory in book form, which is a static instrument rather than the dynamic one an inventory should be. The data that was received from a wide range of sources could only be stored as received or, ultimately, transferred by hand to charts or tables and remained inaccessible to all but a small number of people. The inventory was out-of-date on the day it was published and provided no basis for setting priorities for a national program or a strategy of pollution control. A secondary effect, although a less important one, of the lack of an efficient central system of inventories was that groups and individuals felt encouraged and obligated to hold data and establish inventories on a personal basis in their own special fields of interest. These were the fundamental concerns of having a national inventory system dependent upon a manually maintained data base. A

number of additional problems were also of concern: (a) the available pollutant information which was stored in hard cover file was difficult to retrieve and use for reporting purposes, (b) since the updating facility was almost nil, the status of the information could not give an up-to-date picture of current pollution loads, (c) with the manual file system many man-months were required to compile reports requested by people involved in control of air pollution. Thus the reports were less useful than they could have been if they had been more timely.

These concerns could not have been resolved with the manual system and with continued acquisition of data, the situation would have steadily grown worse.

To make possible the effective update, maintenance and retrieval of data from inventories, it was planned to develop a computerized national inventory of sources and emissions in Canada. Existing systems which could have been acquired and/or modified to meet our requirements were evaluated. Since our proposed file content and format were somewhat similar to those used by the Environmental Protection Agency (EPA) in the United States, the suitability of their IBM Starter System and of the central NEDS were investigated. It was felt that the former would require extensive modification in order to meet our needs while the latter was rather complex and sophisticated for us to consider at the time.

During our study, we were advised of the development of the Comprehensive Data Handling System (CDHS) by EPA, for use by State Governments. The Emissions Inventory Subsystem (EIS) of CDHS was described as being a system allowing the States

to maintain an emissions inventory similar to the one planned by our Directorate. All other existing computer systems available commercially or possibly through other governmental organizations did not appear to be suitable for this application. Therefore, a decision was made to acquire the EIS.

A copy, on magnetic tape, of the EIS was obtained in 1974. The system was evaluated and found to be adaptable to our specific inventory needs. Since then EPA have made available an extension to the EIS; this is the EIS/P and R system. This extension was established mainly to maintain information on permits and registrations pertaining to each source by the States, and has not been found necessary at this time for the inventory function in Environment Canada.

2. Emissions Inventory Subsystem (EIS) Overview

When dealing with atmospheric pollution, it is necessary to amass, catalog, sort, evaluate, and perform calculations upon large volumes of data. The EIS of the CDHS provides a systematic method for collecting these data in a data base that provides a central source for the information needed to help control air pollution. If the system is to be helpful it must maintain the data base, keep the information current, provide a means for access to the information, and present it in a usable form.

The EIS provides the ability to create and maintain, and to retrieve and print data from the data base. The creation and maintenance is accomplished with the File Maintenance program. This program allows the user to keep his data base information current and useful. Access to the data base information is provided by the Retrieval program set. These programs provide the means of extracting desired information from the data base. The output print programs are then used to convert the extracted information to a form readable by the user. These three functions form the basic system.

In addition to the basic system, several preprocessor and postprocessor programs are provided which perform functions necessary to make this system compatible with existing systems. Other programs provide services which help make the maintenance process automatic.

The Emissions Inventory Subsystem of CDHS is organized around two main programs, File Maintenance and Retrieval. There are ten other programs in the system that perform service functions. The interface for the programs that feed the File Maintenance program is the EIS transaction card. The Master File serves as the interface for the rest of the programs.

The EIS components are:

- File Maintenance: a program used to create and maintain the Master File.
- Retrieval Language Processor: a program which generates the retrieval program.
- Retrieval: a program used to extract information from the Master File.

- File List: a program which provides a detailed listing of the Master File.

- Summary Report Output: a program to produce a listing of emission totals for selected control breaks.

- NEDS Point Source Output: a program to convert the Master File to NEDS Point Source card formats.

- NEDS Area Source Output: a program to convert the Master File area records to NEDS Area Source card formats.

- NEDS Area Source Report: a program to print a formatted listing of NEDS Area Source cards.

- NEDS Point Source Conversion: a program to convert NEDS Point Source cards to EIS transaction cards.

- NEDS Area Source Conversion: a program to convert NEDS Area Source cards to EIS transaction cards.

- Emission Factor Table Generator: a program used to generate the emission factors table.

- Emission Factor Insertion: a program which inserts the emission factors into the EIS transactions.

- Emission Factor Transaction Generator: a program which generates transaction cards to update emission factors in the Master File.

3. Modifications to Emissions Inventory Subsystem (EIS)

The computer system envisaged by the Air Pollution Control Directorate of Environment Canada had to be capable of

processing two types of input: 1. data by plant (point source) and 2. data by area (area source). In 1974, following receipt of a copy of the EIS of the CDHS used by EPA in the United States, a study was undertaken to determine the EIS capability to meet our requirements.

The following observations were made regarding the system. There are three types of input - 1. NEDS point source, 2. NEDS area source and 3. the EIS point source. With certain modifications the EIS point source would meet the first requirement of the Directorate - to handle data by plant. As a result the NEDS point source programs CSNEDSCV and HXANREPT were found to be unnecessary. By making additional modifications to the input and output formats it would be possible to use the EIS point source to process area records, thereby making it possible to eliminate the NEDS area source programs AXASNEDS, CXASUMARY and HXANREPT.

Therefore the National Emissions Inventory System (NEIS), the Canadian version of the EIS, would consist of the following programs:

FXFILMNT	EXEFIF
PXFILPRT	EXTBGN
BXSUMARY	EXEFIX
RXCMAINI	

As mentioned earlier, it was necessary to modify these programs in order to meet the needs of the Directorate. A brief summary of the above programs is given in Appendix I. Some of the changes included:

1. The addition of a comment field at the point level.

2. Modifying the master and transaction file definitions as shown in the change lists (Appendix II).

3. Entering the measured and estimated emissions at the process level and rolling them up to the point level. The calculations required for the estimates are determined using the formula shown in Appendix III.

4. Modifying the edit-update so that it is possible to add a process segment without having to add a point segment.

5. Making Area and Point Source reports more legible by:

   (i) improving report layouts

   (ii) adding tables to the print programs to convert codes to text.

6. Adding and maintaining a historical file.

7. Adding a change file which lists changes and additions for the purposes of keeping microfiche printout current.

8. Adding a sort program for the master and transactions files.

9. Possibility to add and delete process records without adding point records.

10. Extension to include air pollution controls at the process level.

11. Extending the number of pollutants for which information can be catalogued from 5 to 16 thus enabling the input of data on some hazardous pollutants.

As a result of these changes, and others, the EIS computer data input forms were modified extensively. Appendix IV presents the modified NEIS forms for point and area sources.

All modifications were completed during the latter part of 1975. Since then the Air Pollution Control Directorate of Environment Canada has been analyzing, coding and feeding to the system the wealth of data accumulated both within and outside the Department throughout the years. The system, which is now operational, will be used extensively to update the nationwide inventory of primary air pollutants.

Addendum I:

PROGRAMS

FXFILMNT - EDIT UPDATE PROGRAM

This program performs two (2) basic functions:

1. It can be used to create a new master file.
2. It can be used to modify an existing master file.

The input consists of transactions which are derived from:

1. User coded documents
2. The EXEFIF program which generates transactions to update (add, delete & modify pollutants) at the machine process level.

There are three types of transactions: (1) Additions (A), (2) Changes (C), and (3) Deletions (D).

Additions are used to create a new system master file and to add new records to an existing file. It is possible to add a plant, a stack or a machine process. In order to add a plant the 01, 02, and 03 card must be present. To add a stack there must be an 11, 12 and at least one 13 card present. In order to add a stack the plant segment must either exist already on the master file or be added simultaneously. To add a machine process a 21, 22 and at least one 23 card must be present. Similarly a machine process cannot be added unless the stack segment either exists already on the master file or is added simultaneously.

Change cards are used to modify an existing master file. Only those fields being changed should be coded. Therefore in order to modify a field on a master record only the transaction card which contains that field need be used. All data fields except those being changed are left blank. It is possible to change any field on a card except the record key, the segment 1 and 2 ID and the pollutant number.

It is possible to delete:

1. An entire logical record of plant segment and all its subordinate stack and machine process segments,
2. A stack segment and all its subordinate machine processes,
3. A machine process.

PXFILPRT - PRINT MASTER FILE

This program is used to display master records. It has two formats: one for point source records and one for area source records. The format, of the two reports, is basically the same, however the area records to not utilize all of the fields required by the point source records so these fields are omitted on the area source report. Also some of the field headings differ on the two reports.

When printing the records each point segment, associated with a given plant segment, starts on a new page. The plant information is therefore repeated for every point segment. The process segments are listed after the point segment information. In some instances the point segment and its process segments will require more than one page. A process segment will never be split over two pages; if there is not enough room at the end of a page to print the entire process segment it will be started on a new page.

This program may be used to list the entire master file after an update (FXFILMNT) or to list the records selected after a special retrieval has been performed (RXCMAINI).

EXTBGN - TABLE GENERATOR

This program is used to generate the Emission Factors Table. The table contains a list of processes (SCC) and their corresponding pollutants and emission factor values.

It is created from cards and is used as input in the EXEFIF and EXEFIX programs.

EXEFIX - ADD EMISSION FACTORS TO TRANSACTIONS

This program adds emission factor values to a transaction before the record is created on the master file (i.e. only for addition) by inserting the emission factor values into the 23 card of the process segment. To perform this function there must be a 21, 22 and one or more 23 cards.

The EF source field (card 22) is examined for the occurrence of a blank or a T. If it is blank, emission factor insertion does not occur. If it contains a T, the program will operate in TABLE mode.

In T mode the EF table is searched using the SCC number from the 21 card as the search argument. When a corresponding SCC is found in the EF table its associated pollutants are compared to the pollutant id in the 23 card. If a match is found the emission factor, the emission factor units of measure code and the A/S percentage flag are inserted into the 23 card transaction.

EXEFIF - TRANSACTION GENERATOR

This program generates transactions for existing master file records in order that the master file may be updated to incorporate changes to the emission factor table. The generated transactions will add or delete pollutants from a process and change emission factor values when processed by the edit-update program.

Which process segments will be modified is determined by the use of a control and containing a date and a mode of operation. The mode of operation determines whether the insertion will be selective or unconditional.

Each process in the Emission Factor Table contains a date. If this date is the same as, or chronologically later, than the date in the control card, transactions will be created containing the new emission factor values to update every corresponding occurrence of the process in the master file.

There are two selective modes N and T. In T mode the EF source field of the master file process segment is examined. If it is not also equal to T then this process segment is skipped. In N mode no comparison is made to the EF source field. Next a comparison is made between the pollutants of the process segment and the pollutants listed in the corresponding SCC in the EF table. If a match is found the new values in the EF table are used to create transactions to update the master file.

In the unconditional mode (X) all of the emission factor values associated with the SCC numbers are inserted into the repeating fields of the process segment overlaying existing ones. There is a search made to ensure that all pollutants inserted into the process segment exist at the point level. If a corresponding pollutant is not found at the point level then one is added.

RXCMAINI - RETRIEVAL PROGRAM

This program will perform retrievals on any field in the plant and point segments. It also has the capability to sort the retrieved records as well as an option which allows the user the decide whether the process segment(s) should be included as part of the retrieved record.

The retrieved data is passed to either the PXFILPRT program which lists the data or the BXSUMARY program which performs summaries on it.

BXSUMARY - PRODUCE SUMMARY LISTINGS

This program is used in conjunction with the RXCMAINI program which retrieves the data and sorts it.

The user can specify up to five (5) fields from the master record which are to be used to control the printing of totals by the program. These control fields must come from the plant or stack segment of the master record. Totals will be produced whenever one of the control fields changes value.

There are five fields which are summarized at every level of totals. They are:

1. Source Count (sum of sources emitting a pollutant)
2. Estimated Emissions
3. Actual Emissions
4. Allowable Emissions
5. Control Equipment Cost

It is possible to personalize these reports by adding up to two (2) page headings and up to five (5) column headings (one for each level of control totals.)

Addendum II:

MODIFICATIONS TO MASTER AND TRANSACTION FILES DEFINITION

CHANGES IN MASTER FILE DEFINITION - SEGMENT 0

STATE CODE - change to PROVINCE

COUNTY CODE - length reduced from 4 to 2 characters

AQCR NUMBER - dropped

PLANT ID - no changes

DATE OF SEGMENT - length reduced from 5 to 4 characters

SEGMENT ID - no change

USER CONTROL REGION - dropped

LOCAL CONTROL - dropped

USER PLANT ID - dropped

CITY - the same length - alphnumeric instead of numeric

UTM ZONE
OWNERSHIP
CONTACT
TELEPHONE
PRINCIPAL PRODUCT
} no changes

NAME & ADDRESS - length reduced from 48 to 42 characters

POSTAL CODE - new field 6 characters in length

NUMBER OF EMPLOYEES
PROPERTY AREA
} no changes

MAILING ADDRESS - length reduced from 48 to 42 characters

POSTAL CODE - new field 6 characters in length

CHANGES IN MASTER FILE DEFINITION - SEGMENT 1

STATE CODE - change to PROVINCE

COUNTY CODE - length reduced from 4 to 2 characters

AQCR NUMBER - dropped

PLANT ID - no changes

DATE OF SEGMENT - length reduced from 5 to 4 characters

SEGMENT ID - no changes

SEGMENT ID SEQUENCE - no change

POINT ID (NEDS) - dropped

POINT ID (USER) - the title has been changed to POINT ID

SIC - length increased from 4 to 5 characters

IPP - dropped

UTM COORDINATES

HORIZONTAL - no decimal places; length increased from 4 to 7 digits

VERTICAL - no decimal places; length increased from 5 to 6 digits

LATITUDE - no change

LONGITUDE - no change

ANNUAL THROUGHPUT - title changed to SEASONAL VARIATION

NORMAL OPERATIONS

BOILER DESIGN CAPACITY

SPACE HEAT

STACK HEIGHT

STACK DIAMETER

STACK TEMPERATURE

EXHAUST FLOW RATE

VELOCITY

PLUME-HEIGHT

POINTS WITH COMMON STACK

} no changes

CHANGES IN MASTER FILE DEFINITION - SEGMENT 1 (cont'd)

- COMPLIANCE STATUS
- COMPLIANCE SCHEDULE
- COMPLIANCE UPDATE
- ECAP
- CONTROL REGULATIONS

  → these fields have been dropped

- NUMBER OF COMMENTS
- COMMENTS

  → these fields have been added - the comments field can occur to a maximum of 4 times

- NUMBER OF POLLUTANTS
- POLLUTANT ID

  → no changes

CONTROL EQUIPMENT COST - the decimal has been removed

- PRIMARY CONTROL EQUIPMENT
- SECONDARY CONTROL EQUIPMENT

  → no changes

ESTIMATED CONTROL EFFICIENCY - an extra decimal place has been added

- EMISSIONS ESTIMATED
- EMISSIONS MEASURED

  → the length of these fields has been increased from 7 to 10 characters; including the addition of 2 decimal places

ALLOWABLE EMISSIONS - the field name has been changed to TOTAL EMISSIONS

EMISSIONS UNITS - no change

ESTIMATION METHOD - this field is now carried in the segment 2 record

TEST METHOD - no change

CHANGES IN MASTER FILE DEFINITION - SEGMENT 2

STATE CODE - changed to PROVINCE

COUNTY CODE - length reduced from 4 to 2 characters

AQCR NUMBER - dropped

PLANT ID - the same

DATE OF SEGMENT - length reduced from 5 to 4 characters

SEGMENT ID
SEGMENT 1 ID
SEGMENT 2 ID
SCC
BEC
FUEL UNITS
} no changes

FUEL, PROCESS, SOLID WASTE - field name changed to BASE QUANTITY

MAXIMUM DESIGN - the decimal has been removed

- the field name has been changed to YEARLY CAPACITY

SULPHUR CONTENT
ASH CONTENT
HEAT CONTENT
CONFIDENTIALITY
} no changes

SOURCE CODE - dropped

SOURCE DESCRIPTION
EF SOURCE
NUMBER OF EF
POLLUTANT ID
EMISSION FACTOR
ASH/SULPHUR CODE
EMISSION FACTOR UNITS
} no changes

CHANGES IN MASTER FILE DEFINITION - SEGMENT 2 (cont'd)

PRIMARY CONTROL EQUIPMENT
SECONDARY CONTROL EQUIPMENT
ESTIMATED CONTROL EFFICIENCY
EMISSIONS
ESTIMATION METHOD

} these fields have been added to the master file

CHANGES TO TRANSACTIONS

KEY - FOR ALL CARDS

STATE - changed to province

COUNTY - reduced to 2 characters

AQCR - dropped

PLANT ID - no change

DATE OF RECORD - YEAR - no change

- DAY - changed to MONTH; length reduced to 2 characters

fields 78-80 of every transaction card

SEGMENT NUMBER
CARD NUMBER } no change
ACTION

CHANGES TO TRANSACTION DEFINITION - SEGMENT 0

CARD 1

CONTROL REGION - this field has been dropped

LOCAL CONTROL - this field has been dropped

USER PLANT ID - this field has been dropped

CITY
UTM ZONE
OWNER
CONTACT
TELEPHONE
PRINCIPAL PRODUCT

} no changes

CARD 2

ESTABLISHMENT NAME & ADDRESS - reduced from 48 to 42 characters

POSTAL CODE - a new field - 6 characters long

NUMBER OF EMPLOYEES
PROPERTY AREA

} no changes

CARD 3

ESTABLISHMENT MAILING ADDRESS - reduced from 48 to 42 characters

POSTAL CODE - a new field - 6 characters long.

CHANGES TO TRANSACTION DEFINITION - SEGMENT 1

CARD 0

SEGMENT 1 ID - no change

COMMENTS - a new field 62 characters long

COMMENT NBR - indicates how many comment cards there are - to a maximum of 4

CARD 1

SEGMENT 1 ID - no change

POINT ID NEDS - this field has been dropped

POINT ID USER - the work USER has been omitted from the title

SIC - the length has been increased from 4 to 5 positions

IPP - this field has been dropped

UTM COORDINATES - HORIZONTAL - increase field length from 4 to 7

- VERTICAL - increase field length from 5 to 6

LATITUDE, LONGITUDE } no change

% ANNUAL THROUGHPUT - the title has changed to Seasonal Variation

NORMAL OPERATING, BOILER DESIGN CAPACITY, % SPACE HEAT } no changes

CHANGES TO TRANSACTION DEFINITION - SEGMENT 1 (cont'd)

CARD 2

- SEGMENT 1 ID
- HEIGHT
- DIAMETER
- TEMPERATURE
- FLOW RATE
- VELOCITY
- PLUME HEIGHT
- POINTS WITH COMMON STACK

→ no changes

- COMPLIANCE STATUS
- COMPLIANCE SCHEDULE
- COMPLIANCE STATUS UPDATE
- ECAP
- CONTROL REGULATIONS

→ these fields have been dropped

CARD 3

- SEGMENT 1 ID
- POLLUTANT ID

→ no changes

CONTROL EQUIPMENT COST - the decimal has been removed

- PRIMARY CONTROL EQUIPMENT
- SECONDARY CONTROL EQUIPMENT

→ no changes

ESTIMATED CONTROL EFFICIENCY - an extra decimal place has been added

EMISSIONS ESTIMATED - this field is now carried in segment 2

MEASURED EMISSIONS - this field is now carried in segment 2

ALLOWABLE EMISSIONS - field length increased from 7 to 10; including decimal position name changed to TOTAL EMISSIONS

CHANGES TO TRANSACTION DEFINITION - SEGMENT 1 (cont'd)

CARD 3 (cont'd)

EMISSIONS UNITS - no change

ESTIMATION METHOD - this field is now carried in segment 2

TEST METHOD - no change

CHANGES TO TRANSACTION DEFINITION - SEGMENT 2

CARD 1

- SEGMENT 1 ID
- SEGMENT 2 ID
- SCC
- BEC
- FUEL UNITS

no changes

FUEL PROCESS, SOLID WASTE, OPERATING RATE - field name changed to BASE QUANTITY

MAXIMUM DESIGN RATE - the decimal has been removed

- the field name has been changed to YEARLY CAPACITY

- SULPHUR CONTENT
- ASH CONTENT
- HEAT CONTENT

no changes

DATE OF NEW RECORD - this field has been added

CARD 2

- SEGMENT 1 ID
- SEGMENT 2 ID
- CONFIDENTIALITY

no changes

SOURCE CODE - this field has been dropped

- SOURCE DESCRIPTION
- EF SOURCE

no changes

CHANGES TO TRANSACTION DEFINITION - SEGMENT 2 (cont'd)

CARD 3

SEGMENT 1 ID	no changes
SEGMENT 2 ID	
POLLUTANT ID	
EMISSION FACTOR	
ASH CODE	
EF UNITS	
POLLUTANT ID	These repititions have been dropped. There is now only 1 pollutant per 23 cards.
EMISSION FACTOR	
ASH CODE	
EF UNITS	
POLLUTANT ID	
EMISSION FACTOR	
ASH CODE	
EF UNITS	
PIRMARY CONTROL EQUIPMENT	These fields have been added to every 23 card
SECONDARY CONTROL EQUIPMENT	
ESTIMATED CONTROL EFFICIENCY	
EMISSIONS	
EMISSION TYPE	

Addendum III:

FORMULA FOR CALCULATING EMISSIONS

FORMULA FOR CALCULATING EMISSIONS

1. BASE QUANTITY X EMISSION FACTOR = UNCONTROLLED EMISSIONS
2. UNCONTROLLED EMISSIONS X (ASH/SULPHUR) = ADJUSTED EMISSIONS
3. ADJUSTED EMISSIONS X CONTROL EFFICIENCY (SEG 2) = EMISSION REDUCTION (SEC 2)
4. ADJUSTED EMISSIONS - REDUCTION (SEG2) = CONTROLLED EMISSIONS (SEG 2)
5. CONTROLLED EMISSIONS (SEG 2) X CONTROL EFFICIENCY (SEG 1) = EMISSION REDUCTION (SEG 1)
6. CONTROLLED EMISSIONS (SEG 2) - EMISSION REDUCTION (SEG 1) = CONTROLLED EMISSIONS (SEG 1)
7. $\frac{\text{CONTROLLED EMISSIONS (SEG 1)}}{2000}$ = EMISSIONS IN TONS

Addendum IV:

NEIS MODIFIED COMPUTER INPUT FORMS
FOR POINT AND AREA SOURCES

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour Year-An		Mo.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

Environment Canada
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Air Pollution Control Directorate
National Emissions Inventory Section

N.E.I. System
Système I.N.R.P.

Environnement Canada
Protection de l'Environnement

Direction générale de la lutte contre la pollution atmosphérique
Section de l'inventaire national des rejets de polluants

POINT SOURCE SOURCE PONCTUELLE
Plant Segment
Segment relatif à l'installation (0)

City Ville	U.T.M. Zone Zone U.T.M.	Owner / Propriétaire	Personal Contact Contact Personnel	Telephone Téléphone	Principal Product Produit principal	Date of Historical Record Compte rendu historique pour Y/A	M/M	Segment	Card / Carte	Action / Ordre
13 14 15 16	17 18	19	20 21 22 23 24 25 26 27 28 29 30 31 32 33 34	35 36 37 38 39 40 41 42 43 44	45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65	66 67	68 69	70 71 72 73 74 75 76 77	78	79	80

Establishment Name and Address Nom et adresse de l'établissement	Postal Code Code Postal	Number of Employees Nombre d'employés	Property Area Surface de la propriété	Segment	Card / Carte	Action / Ordre
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54	55 56 57 58 59 60	61 62 63 64	65 66 67 68 69 70	71 72 73 74 75 76 77	78	79	80

Establishment Mailing Address Adresse postale de l'établissement	Postal Code Code Postal	Segment	Card / Carte	Action / Ordre
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54	55 56 57 58 59 60	61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77	78	79	80

04-1007 (09/75)

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Section de l'inventaire national des rejets de polluants

N.E.I. System
Système I.N.R.P.

POINT SOURCE – SOURCE PONCTUELLE

Point Segment
Segment relatif à la source (1)

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour Year-An		Mo.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

Segment 1 I.D. ID. du segment 1	Comments — Remarques	Comment Number/ No du commentaire	Segment	Card / Carte	Action / Ordre
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76	77	78	79	80

Segment 1 I.D. ID. du segment 1	Point Identification ID. de la source	Standard Industrial Classification Classification normalisée des industries	U.T.M. Coordinates Coordonnées UTM		Latitude			Longitude			Seasonal Variation Variations saisonnières												Normal Operating Exploitation normale			Boiler Design Capacity Puissance théorique des chaudières		Is Space Heat % du chauffage des locaux		Segment	Card / Carte	Action / Ordre
			Horizontal Horizontales	Vertical Verticales	Degrees Degrés	Minutes	Seconds Secondes	Degrees Degrés	Minutes	Seconds Secondes	January Janvier		April Avril		July Juillet		October Octobre		Hours Heures		Days/Jours		Weeks/Sem.								
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76																														

04-1969 (03/75)

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour Year-An		No.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

| Segment 1 I.D. ID. du segment 1 | Stack Data — Données relatives á la cheminée | | | | | | | | | | |

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Section de l'inventaire national des rejets de polluants

N.E.I. System
Système I.N.R.P.

POINT SOURCE – SOURCE PONCTUELLE

Process Segment
Segment relatif au procédé (2)

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour Year-An		Mo.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

| Segment 1 I.D. ID. du segment 1 | Segment 2 I.D. ID. du segment 2 | Standard Classification Code Code de classification normalisée | | | | Basic Equipment Code Code du matériel de base | | Base Units Unités de base | Base Quantity Quantité de base | Yearly Capacity Capacité annuelle | Sulphur Content Teneur en soufre | Ash Content Teneur en cendres | Heat Content Enthalpie | | | | | | | | | | |

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour Year-An Mo.-Mois			
1	2	3	4	5	6	7	8	9	10	11	12

Segment 1 I.D. ID. du segment 1	Segment 2 I.D. ID. du segment 2	Pollutant I.D. ID. du Polluant	Emission Factor Facteur d'émission	Ash/Sulphur Cendres/soufre	E.F. Units Unités de F.E.	Primary Control Equipment Matériel antipollution primaire	Secondary Control Equipment Matériel antipollution secondaire	Estimated Control Efficiency Efficacité Estimative	Emissions	Estimating Method Mode d'évaluation	Segment	Card / Carte	Action / Ordre
13 14	15 16	17 18 19 20 21	22 23 24 25 26 27 28	29 30	31 32	33 34	35 36 37	38 39 40	41 42 43 44 45 46 47 48 49 50	51 52 53	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80		

04-1911 (05/75)

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour Year-An		Mo.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

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N.E.I. System
Système I.N.R.P.

AREA SOURCE – SOURCE SECTORIELLE
Segment (0)

| City Ville | U.T.M. Zone Zone U.T.M. | Locality Code Code de localité | | | | | | | | | | |

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour			
								Year-An		Mo.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

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Section de l'inventaire national des rejets de polluants

N.E.I. System
Système I.N.R.P.

AREA SOURCE – SOURCE SECTORIELLE
Segment (1)

13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Segment 1 I.D. ID du segment 1	Comments — Remarques																																																																							Comment Number No du commentaire	Segment	Card / Carte	Action / Ordre

13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Segment 1 I.D. ID du segment 1	Area source I.D. ID. de la source sectorielle	Standard Industrial Classification Classification normalisée des industries																																	January Janvier		April Avril		July Juillet		October Octobre	Normal Operation Exploitation normale Hours Heures		Days/Jours		Weeks Semaines																		

Prov.		County Comté		Plant ID. ID. de l'usine				Date of record Compte rendu pour Year-An		Mo.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

Segment 1 I.D. ID. du segment 1	Segment	Card / Carte	Action / Ordre
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77	78	79	80

Segment 1 I.D. ID. du segment 1	Pollutant I.D. ID. du polluant	Control Equipment Cost Coût du matériel antipollution	Primary Control Equipment Matériel antipollution primaire	Secondary Cont. Equipment Matériel antipollution secondaire	Estimated Control Efficiency Efficacité estimative	Total Emissions Emissions totales	Emis. Unit / Unités	Test Method Mode de contrôle	Segment	Card / Carte	Action / Ordre
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77									78	79	80

04-1510 (09/75)

Environment Canada
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National Emissions Inventory Section

Environnement Canada
Protection de l'Environnement

Direction générale de la lutte contre la pollution atmosphérique
Section de l'inventaire national des rejets de polluants

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour Year-An		Mo.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

N.E.I. System
Système I.N.R.P.

AREA SOURCE – SOURCE SECTORIELLE
Segment (2)

Segment 1 I.D. ID. du segment 1	Segment 2 I.D. ID. du segment 2	Standard Classification Code / Code de classification normalisée I II III IV	Base Unit Unités de base	Base Quantity / Quantité de base	Sulphur Content Teneur en soufre	Ash Content Teneur en cendres	Heat Content Enthalpie	Segment	Card / Carte	Action / Ordre
13 14	15 16	17 18 19 20 21 22 23 24	25 26 27 28 29 30	31 32 33 34 35 36 37	38 39 40 41 42 43 44	45 46 47	48 49 50	51 52 53 54 55	56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77	78	79	80

Segment 1 I.D. ID. du segment 1	Segment 2 I.D. ID. du segment 2	Confident.	Source Description / Description de la source	E.F. Source Source du F.E.	Segment	Card / Carte	Action / Ordre
13 14	15 16	17	18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42	43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77	78	79	80

04-1912 (09/75)

B - II, 39

Prov.		County Comté		Plant I.D. ID. de l'usine				Date of record Compte rendu pour			
								Year-An		Mo.-Mois	
1	2	3	4	5	6	7	8	9	10	11	12

Segment 1 I.D. ID. du segment 1	Segment 2 I.D. ID. du segment 2	Pollutant I.D. ID. du Polluant	Emission Factor Facteur d'émission	Ash/Sulphur Cendres/soufre	F.F. Units Unités du F.F.	Primary Control Equipment Materiel antipollution primaire	Secondary Control Equipment Materiel antipollution secondaire	Estimated Control Efficiency Efficacité Estimative	Emissions	Estimating Method Mode d'évaluation		Segment	Card / Carte	Action / Ordre
13 14	15 16	17 18 19 20 21	22 23 24 25 26 27 28 29 30	31	32	33 34	35 36	37 38	39 40 41 42	43 44 45 46 47 48 49 50 51	52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77	78	79	80

04-1912 (09/75)

Addendum V:

RESOURCES REQUIRED TO ESTABLISH AND OPERATE CANADA'S NATIONAL EMISSIONS INVENTORY SYSTEM (NEIS)

.....Resources required to establish and operate Canada's National Emissions Inventory System (NEIS).....

The system has been designed to store and retrieve data on air pollutant emissions throughout Canada, which has an area of 9 975 165 sq. km. and a population of 23 250 000 inhabitants.

Status on April 1, 1978

(A) Establishment of System (over a period of 3 years)

- System: EPA's EIS sub-system acquired at no cost in fall 1973.

- Computing Services & Programming:

  (i) internally: 10 man-months, $24 000. (Cdn.)
  (ii) under outside contract: major modifications made at cost of $15 000. (Cdn.)

- Computer Time: $11 000. (Cdn.) for testing purposes mostly

- Organization, Analysis and Coding of Data: 14.5 man-months, $19 000. (Cdn.)

(B) Operation of System (on a yearly basis)

- Computing Services: 4 man-months, $7 000. (Cdn.)

- Computer Time & Key-Punching: $6 000. (Cdn.)

- Organization, Engineering Analysis, and Coding of Data: 12 man-months, $15 000. (Cdn.)

ANNEX I

Names and Addresses of Panel Members (as of Fall 1978)

R. D. Bauman	Environmental Protection Agency (OAQPS - SASD - ESB - MD - 12) Research Triangle Park USA - 27711 North Carolina
A. Berger	Institut d'Astronomie et de Géophysique Université Catholique de Louvain 2, Chemin du Cyclotron B - 1348 Louvain la Neuve
A. Braig	Battelle Institut Am Römerhof 35 D-6000 Frankfurt 90
P. J. Choquette	Air Pollution Control Directorate Environment Canada Cdn - Ottawa, Ont. K I A IC8
R. Dams	University of Gent Institute Nuclear Sciences Proeftuinstraat 86 B - Gent 9000
C. De Wispelaere	Diensten voor Programmatie van het Wetenschapsbeleid Wetenschapsstraat 8 1040 Brussel
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ANNEX II

NATO/CCMS Documents on the First Air Pollution Pilot Study (available at: NATO/Committee on the Challenges of Modern Society, NATO Headquarters, Brussels, Belgium)

AIR POLLUTION (No. 5)

Proceedings of the 2nd Meeting of the Expert Panel on Air Pollution Modeling, (26 - 27 July 1971, Paris, France). Out of stock

AIR POLLUTION (No. 6)

Guidelines to Assessment of Air Quality (Revised)

APPENDIX A	Assessment of Air Quality in Ankara (February 1973)
APPENDIX B	Assessment of Air Quality in St. Louis (February 1973)
APPENDIX C	Assessment of Air Quality in Frankfurt (June 1974)
APPENDIX D	Assessment of Air Quality in Oslo (February 1973)
APPENDIX E	Assessment of Air Quality in the South Holland Region (December 1973)

AIR POLLUTION (No. 7)

Quality Criteria for Sulphur Oxides (November 1971). Out of stock

AIR POLLUTION (No. 8)

Air Quality Criteria for Particulate Matter (November 1971). Out of stock

AIR POLLUTION (No. 10)

Air Quality Criteria for Carbon Monoxide (June 1972)

AIR POLLUTION (No. 12)

Control Techniques for Sulphur Oxide Air Pollutants (October 1973)

AIR POLLUTION (No. 13)

Control Techniques for Particulate Air Pollutants (October 1973)

AIR POLLUTION (No. 14)

Proceedings of the 3rd Meeting of the Expert Panel on Air Pollution Modeling
(2 - 3 October, 1972, Paris)

AIR POLLUTION (No. 15)

Air Quality Criteria for Nitrogen Oxides (June 1973)

AIR POLLUTION (No. 18)

Control Techniques for Carbon Monoxide Emissions from Stationary Sources (October 1973)

AIR POLLUTION (No. 19)

Control Techniques for Hydrocarbon and Organic Solvent Emissions from Stationary Sources (October 1973)

AIR POLLUTION (No. 20)

Control Techniques for Nitrogen Oxide Emissions from Stationary Sources (October 1973)

AIR POLLUTION (No. 29)

Air Quality Criteria for Photochemical Oxidants and Related Hydrocarbons (February 1974)

AIR POLLUTION (No. 30)

Proceedings of the 4th Meeting of the Expert Panel on Air Pollution Modeling, (28 - 30 May 1973, Oberursel, Germany)

AIR POLLUTION (No. 33)

Final Report (May 1974)

AIR POLLUTION (No. 35)

Proceedings of the 5th Meeting of the Expert Panel on Air Pollution Modeling (4 - 6 June 1974, Roskilde, Denmark)

AIR POLLUTION (No. 41)

First Follow-up Report (December 1975)

AIR POLLUTION (No. 50)

Second Follow-up Report (December 1976)

AIR POLLUTION (No. 67)

Third Follow-up Report (November 1977)

AIR POLLUTION (No. 96)

Fourth Follow-up Report (October 1978)

AIR POLLUTION (No. 6, Appendix C revised)

Assessment of Air Quality in Frankfurt (December 1977)

ANNEX III

NATO/CCMS Documents on the Pilot Study on Air Pollution Assessment Methodology and Modeling
(available at: NATO/Committee on the Challenges of Modern Society, NATO Headquarters, Brussels, Belgium)

Air Pollution (No. 42)

Proceedings of the 6th International Technical Meeting on Air Pollution Modeling and its Application
(24 - 26 September 1976, Frankfurt/Main, Germany)

Air Pollution (No. 51)

Proceedings of the 7th International Technical Meeting on Air Pollution Modeling and its Application
(7 - 10 September 1976, Airlie House, USA)

Air Pollution (No. 70)

Bibliography on Grey Literature on Air Quality Modeling, Part I (Applied Models) (October 1977)

Air Pollution (No. 71)

Air Quality Management Systems (AQMS) (October 1977)

Air Pollution (No. 88)

Bibliography on Grey Literature on Air Quality Modeling, Part II (New Modeling Techniques) (October 1978)

Air Pollution (No. 89)

Glossary of Terms Generally Used in Air Pollution Assessment Methodology and Modeling (October 1978)

Air Pollution (No. 80)

Proceedings of the 8th International Technical Meeting on Air Pollution Modeling and its Application
(20 - 23 September 1977, Louvain-la-Neuve, Belgium)

Air Pollution (No. 99)

Introduction to Air Quality Modeling (October 1978)

Air Pollution (No. 100)

Air Pollution Emissions Projecting (October 1978)

Air Pollution (No. 101)

Uses and Needs for Air Quality Modeling (May 1979)

Air Pollution (No. 102)

Fundamentals for the Application of a Gaussian Plume Model (April 1979)

Air Pollution (No. 104)

Air Pollution Emissions Inventory Systems
(October 1978/July 1979)

APPENDIX A: Emissions Inventory in Belgium
APPENDIX B: Emissions Inventory in Canada
APPENDIX C: Emissions Inventory in Germany, Federal Republic of
APPENDIX D: Emissions Inventory in The Netherlands
APPENDIX E: Emissions Inventory in Norway
APPENDIX F: Emissions Inventory in the United States of America

Air Pollution (No. 106)

Practical Demonstration of Multiple Source Urban Air Quality Modeling (Gaussian Plume) (August 1979)

Air Pollution (No. 71, Revised)

Air Quality Management Systems (AQMS) (April 1979)

Air Pollution (No. 105)

FINAL REPORT (October 1979)

Air Pollution (No. 103)

Proceedings of the 9th International Technical Meeting on Air Pollution Modeling and its Application
(28 - 31 August, 1978, Toronto, Canada)

Air Pollution (No. 108)

Proceedings of the 10th International Technical Meeting on Air Pollution Modeling and its Application
(23 - 26 October, 1979, Roma, Italy)